PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in or relating to Calcium Sulphate Plasters and Cements and Products Made Therefrom

We, VICTOR LEFEBURE, a British Subject, JOSEPH JOHN ETRIDGE, a British Subject, and IMPERIAL CHEMICAL INDUSTRIES LIMITED, a British Company, all of Imperial Chemical House, Millbank, London, S.W.1, do hereby declare the nature of this invention to be as follows:—

This invention relates to calcium sulphate plasters and cements and products made therefrom.

Calcium sulphate plasters such as plaster of Paris and anhydrite plaster, or calcium sulphate-slag cements, are resistant to moderately high temperatures such as occur in ordinary combustion, but they are apt to disintegrate if subjected to temperatures of over 1500° C. The principal object of this invention is to provide calcium sulphate plasters and cements which will withstand such high temperatures.

According to our invention calcium sulphate plasters and cements are made resistant to very high temperatures of the order of 2000° C. by adding to the plaster or cement a substantial proportion of a substance or mixture of substances which does not melt or soften below about 1600° C., or a substance or mixture of substances giving rise to such substance or substances. Suitable substances for addition to the plaster or cement are coarsely ground mineral anhydrite and ground limestone. The latter decomposes at about 1000° C. giving rise to calcium oxide, which does not melt or soften below 1500° C.

The physical form of the added substance appears to be important, as crushed rock gypsum is fairly effective while chemically prepared gypsum or crushed set plaster of Paris is ineffective. Preferably, therefore, the added substance is in as dense a form as possible.

The invention may be applied to any kind of calcium sulphate plaster or cement, in particular to plaster of Paris, anhydrite plaster and calcium sulphate-slag cement. (By anhydrite plaster is meant plaster the setting properties of which depend essentially upon the hydration of mineral anhydride under the influence of small proportions of suitable accelerators such as alkali metal salts and certain metal sulphates. By calcium sulphate-slag cement is meant a composition containing calcium sulphate and ground blast furnace slag, with or without a small proportion of an exciter such as Portland cement).

In the case where anhydrite is added to an anhydrite plaster, the added anhydrite should be coarse compared with the anhydrite of the plaster so that the added anhydrite does not suffer appreciable hydration as a result of the presence of the accelerators. The grading of the added anhydrite in this case should be such that it is all retained in a 72 B.S. sieve. The grading of limestone, where this is used as addition, is not critical—it may be coarse or fine.

The plaster or cement may contain a small amount of organic filler, e.g. sawdust, but the amount of organic filler should not be so great as to interfere appreciably with the heat-resisting properties of the plaster or cement. Fibrous inorganic fillers such as asbestos, especially the variety known as chrysotile, may be added if desired. The plaster or cement should preferably be free from substances which melt or soften below about 1600° C., e.g. silica.

EXAMPLE.

Anhydrite plaster, consisting of mineral anhydrite ground so that 98 per cent. passed a 52 B.S. sieve and 12 per cent. was retained on a 172 B.S. sieve, together with 0.7 per cent. by weight of potassium sulphate and 1.0 per cent. by weight of zinc sulphate, was mixed with an equal weight of coarsely ground anhydrite. The grading of this anhydrite was such that it passed a 36 B.S. sieve and was retained on a 72 B.S. sieve.

The resulting plaster was gauged with water and plastered on to a sheet of $\frac{1}{2}$ inch thick iron to a thickness of $\frac{1}{4}$ inch. A charge of 50 grams of an incendiary mixture comprising powdered aluminium and iron oxide was ignited in a paper container resting upon the plaster surface. After the reaction was complete

and the resulting molten iron had solidified the residue was removed. The plaster layer was penetrated to within $^1/_{32}$ inch of the iron, but no damage was done to the iron.

A similar test was made on a sheet of $\frac{1}{8}$ inch thick iron coated with a $\frac{1}{8}$ inch layer of the same anhydrite plaster but containing an equal weight of ground limestone instead of the coarsely ground anhydrite. The grading of the limestone was the same as that of the same anhydrite used in the preceding test. The plaster layer was penetrated to within $^1/_{44}$ inch of the iron, but no damage was done to the iron.

A further similar test was made on a sheet of $\frac{1}{8}$ inch thick iron coated with a $\frac{1}{8}$ inch layer of the same anhydrite plaster, but without any addition. The plaster layer was penetrated by the molten iron, which welded on to the iron sheet in places, but the sheet itself was not penetrated.

For comparison it may be noted that the same charge of incendiary mixture as was used in the above tests penetrated a $\frac{1}{2}$ inch steel plate when ignited thereon.

The proportion of anhydrite or limestone to be added may range from 20 per cent. by weight of the plaster or cement upwards. With proportions of such over 50 per cent. the speed of set of the plaster or cement may be materially altered. It will be understood that the added anhydrite and limestone do not take any part in the setting process, the former being too coarsely ground to suffer appreciable hydration and the latter being inert by nature.

Dated the 28th day of September, 1938

E. A. BINGEN,
Solicitor for the Applicants.

COMPLETE SPECIFICATION

Improvements in or relating to Calcium Sulphate Plasters and Cements and Products Made Therefrom

We, VICTOR LEFEBURE, a British Subject, JOSEPH JOHN ETRIDGE, a British Subject, and IMPERIAL CHEMICAL INDUSTRIES LIMITED, a British Company, all of Imperial Chemical House, Millbank, London, S.W.1, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to calcium sulphate plasters and cements and products made therefrom.

Calcium sulphate plasters such as plaster of Paris and anhydrite plaster, or calcium sulphate-slag cements, are resistant to moderately high temperatures such as occur in ordinary combustion, but they are apt to disintegrate if subjected to temperatures of over 1500° C. The principal object of this invention is to provide calcium sulphate plasters and cements which will withstand such high temperatures.

According to our invention calcium sulphate plasters and cements are made resistant to very high temperatures of the order of 2000° C. by adding to the plaster or cement at least 20 per cent. of crushed rock anhydrite, crushed limestone or crushed rock gypsum, or of a mixture of two or all of these substances, the grading of the added anhydrite, limestone or gypsum being such that the material is retained on a 72 B.S. sieve but passes a 10 B.S. sieve. (B.S. stands for British Standard).

We have found that the physical form of the added substances is important, as crushed rock gypsum is effective while chemically prepared gypsum or crushed set plaster of Paris is ineffective. The added substance therefore, must be in as dense a form as possible, i.e. as crushed rock.

The invention may be applied to any kind of calcium sulphate plaster or cement, in particular to plaster of Paris, anhydrite plaster and calcium sulphate-slag cement (By anhydrite plaster is meant plaster the setting properties of which depend essentially upon the hydration of mineral anhydrite under the influence of small proportions of suitable accelerators such as alkali metal salts and certain metal sulphates. By calcium sulphate-slag cement is meant a composition containing calcium sulphate and ground blast furnace slag, with or without a small proportion of an exciter such as Portland cement).

The plaster or cement may contain a small amount of organic filler, e.g. 1—3 per cent. of sawdust, but the amount of organic filler should not be so great as to interfere appreciably with the heat-resisting properties of the plaster or cement. Fibrous inorganic fillers such as asbestos, especially the variety known as chryso-tile, may be added if desired. The plaster

or cement should preferably be free from substances which melt or soften below about 1600° C., e.g. silica.

EXAMPLE.

Anhydrite plaster, consisting of mineral anhydrite ground so that 98 per cent. passed a 22 B.S. sieve and 12 per cent. was retained on a 172 B.S. sieve, together with 0.7 per cent. by weight of potassium sulphate and 1.0 per cent. by weight of zinc sulphate, was mixed with an equal weight of coarsely ground anhydrite. The grading of this anhydrite was such that it passed a 36 B.S. sieve and was retained on a 72 B.S. sieve.

The resulting plaster was gauged with water and plastered on to a sheet of $^1/_8$ inch thick iron to a thickness of $^1/_8$ inch. A charge of 50 grams of an incendiary mixture comprising powdered aluminium and iron oxide was ignited in a paper container resting upon the plaster surface. After the reaction was complete and the resulting molten iron had solidified the residue was removed. The plaster layer was penetrated to within $^1/_{32}$ inch of the iron, but no damage was done to the iron.

A similar test was made on a sheet of $^1/_8$ inch thick iron coated with a $^1/_8$ inch layer of the same anhydrite plaster but containing an equal weight of ground limestone instead of the coarsely ground anhydrite. The grading of the limestone was the same as that of the anhydrite used in the preceding test. The plaster layer was penetrated to within $^1/_{64}$ inch of the iron, but no damage was done to the iron.

A further similar test was made on a sheet of $^1/_4$ inch thick iron coated with a $^1/_8$ inch layer of the same anhydrite plaster, but without any addition. The plaster layer was penetrated by the molten iron, which welded on to the iron sheet in places, but the sheet itself was not penetrated.

For comparison it may be noted that the same charge of incendiary mixture as was used in the above three tests penetrated a $^1/_4$ inch steel plate when ignited thereon.

The proportion of anhydrite or limestone to be added may range from 20 per cent. by weight of the plaster or cement upwards. With proportions of much over 50 per cent. the speed of set of the plaster or cement may be materially altered, and it will be understood that the proportion of substance to be added must not be so great as to affect adversely the normal setting properties of the composition.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1) A calcium sulphate plaster or cement to which has been added at least 20 per cent. of crushed rock anhydrite, crushed limestone or crushed rock gypsum, or of a mixture of two or all of these substances, the grading of the added anhydrite, limestone or gypsum being such that the material is retained on a 72 B.S. sieve but passes a 10 B.S. sieve.

2) An anhydrite plaster to which has been added at least 20 per cent. of crushed rock anhydrite, crushed limestone or crushed rock gypsum, or of a mixture of two or all of these substances, the grading of the added anhydrite, limestone or gypsum being such that the material is retained on a 72 B.S. sieve but passes a 10 B.S. sieve.

3) Plaster of Paris to which has been added at least 20 per cent. of crushed rock anhydrite, crushed limestone or crushed rock gypsum, or of a mixture of two or all of these substances, the grading of the added anhydrite, limestone or gypsum being such that the material is retained on a 72 B.S. sieve but passes a 10 B.S. sieve.

4) A calcium sulphate-slag cement to which has been added at least 20 per cent. of crushed rock anhydrite, crushed limestone or crushed rock gypsum, or of a mixture of two or all of these substances, the grading of the added anhydrite, limestone or gypsum being such that the material is retained on a 72 B.S. sieve but passes a 10 B.S. sieve.

5) Products comprising a set plaster or cement according to any of Claims 1—4.

Dated the 25th day of September, 1939.

E. A. BINGEN,
Solicitor for the Applicants.

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